Title: COMPARISON OF THE EFFECT OF NITROGLYCERIN AND ESMOLOL ON THE CARDIOVASCULAR RESPONSE TO ECT

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Introduction. Electroconvulsive therapy (ECT), a widely accepted modality for the treatment of depression, invokes a massive sympathetic nervous system discharge which results in hypertension and tachycardia. The increases in myocardial oxygen consumption may lead to myocardial oxygen imbalance and increased risk for cardiovascular complications in patients with cardiovascular disease.[1] This study was designed to assess and compare the efficacy of esmolol and nitroglycerin pretreatment in the attenuation of the hyperdynamic responses to ECT.

Methods. This study was approved by the Institutional Review Board. Thirteen patients were included in the study for 21 series of ECT's. Each series consisted of 3 pretreatments (saline, nitroglycerin, esmolol), in a randomized, double blind placebo controlled protocol. Patients ranged in age from 48-90 years. Nine patients had no associated medical problems, 2 patients were mildly hypertensive, and 2 patients had stable coronary artery disease.

No preoperative medication was given. Anesthesia was induced with methohexital ($1\ mg\ kg^{-1}$) and succinylcholine ($1.25\ mg\ kg^{-1}$) after pre-oxygenation for 3 minutes. Following induction, patients received either esmolol ($1\ mg\ kg^{-1}$), nitroglycerin ($6\ ug\ kg^{-1}$), or saline (placebo) as a bolus over 30 sec. Blood pressure and heart rate were continuously monitored with a noninvasive finger plethysmography, (Finapres™) and a single lead ECG (lead II). Data were analyzed using a one way ANOVA with replications. A $p<0.05$ was considered statistically significant.

Results. Esmolol significantly attenuated the heart rate and blood pressure responses ($p<.001$) to ECT while nitroglycerin was not more effective than placebo (fig 1 and 2). No patients developed bradycardia, hypotension, or adverse outcome during these treatments.

Discussion. The electrical stimulus of ECT produces a brief parasympathetic surge followed by a period of massive sympathetic hyperactivity. This response increases myocardial oxygen consumption by increasing heart rate and arterial pressure. Esmolol, given as a bolus injection, produces brief beta-adrenergic blockade, whose duration appears similar to peak sympathetic stimulation. The attenuation of heart rate and blood pressure seen with esmolol suggest a potential beneficial effect on myocardial O_2 balance. By contrast, nitroglycerin did not have any effect on those important determinants of myocardial O_2 consumption. These results are at variance with previous work reporting the efficacy of nitroglycerin.[2]

Therefore, esmolol pretreatment appears to be beneficial in reducing the hyperdynamic cardiovascular responses which follow ECT, and may be considered the treatment of choice in patients with coronary artery disease.

References.

1. Gerring JP, Shields HM: The identification and management of patients with a high risk for cardiac arrhythmias during modified ECT. J Clin Psychiatry 43(4):140-143, 1982.

2. Lee JT, et al: Modification of electroconvulsive therapy induced hypertension with nitroglycerin ointment. Anesthesiology 62:793-796,1985.